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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/779,812	02/08/2001	Sudipta K. Ray	END920010002US1	5588

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EXAMINER

NGUYEN, HA T

ART UNIT

PAPER NUMBER

2812

DATE MAILED: 01/30/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Applicati n N .

09/779,812

Examiner

Ha T. Nguyen

Applicant(s)

RAY ET AL.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on _____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,5-12,16-25 and 27-30 is/are rejected.
- 7) ☒ Claim(s) 4,13-15 and 26 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 February 2001 ^{with the correction of 5-24-01} is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 24 May 2001 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

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DETAILED ACTION

Notice to applicant

1. In view of Applicant's argument, the restriction requirement has been withdrawn.
Claim 11 is a duplication of claim 9.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(a) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-3, 6, 20, 21, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kang et al., YOR919950085US1 (Hereinafter Kang).

Kang discloses a method for forming an electronic structure and inherently the structure formed by the method, the method comprising the steps of providing a substrate (solderable layer of Ni, Co, Fe...); and soldering a lead-free solder member to the substrate without using a joining solder to effectuate the soldering, wherein the solder member comprises a tin-antimony alloy that includes predominantly Sn and about 1-10 % Sb by weight (See page 4); wherein the soldering step includes inherently reflowing the solder member to make it adhere to the substrate (see page 2); wherein the substrate includes a semiconductor chip (see page 2).

But it does not disclose expressly the claimed range of percentage of Sb.

However, it has been shown that in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists (see MPEP 2144.05).

Therefore, it would have been obvious to use Kang's teaching to obtain the invention as specified in claims 1-3, 6, 20, 21, and 23 .

4. Claims 5 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kang in view of Desai et al., U.S. Patent 6281581 (Hereinafter Desai).

Kang discloses substantially the limitations of claims 5 and 22, as shown above.

But it does not disclose expressly wherein the substrate includes a ceramic ball grid array module or a plastic ball grid array module.

However, it is well known in the art because Desai discloses this feature (See col.6, lines 17-25 and par. bridging cols. 1 and 2) .

A person of ordinary skill is motivated to modify Kang with Desai to obtain flexibility in mass production.

Therefore, it would have been obvious to combine Kang with Desai to obtain the invention as specified in claims 5 and 22 .

5. Claims 7-11, 16-19, 24, 25, 27, 29, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Desai in view of Kang.

Referring to Fig. 5B and related text, Desai discloses a method of forming an electronic structure and inherently the electronic structure formed, the method comprising: providing a first substrate 628 and a second substrate 624; soldering a solder member 632 to the first substrate without using a joining solder to effectuate the soldering; and soldering the solder member to the second substrate with a joiner solder 630; wherein the first substrate includes a ceramic ball grid array (CBGA) module or a plastic ball grid array (PBGA) module (see par. bridging cols. 1 and 2); and wherein the first substrate includes a semiconductor chip (see col. 6, lines 45-54); wherein the step of soldering the solder member to the second substrate includes reflowing the joiner solder at a temperature above a liquidus temperature of the joiner solder (see col. 6, lines 46-54), the examiner interprets that the joiner solder reflows at a temperature above its liquidus

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temperature; wherein the step of soldering the solder member to the second substrate does not include melting the solder member (see col. 6, lines 17-25); and wherein the step of soldering the solder member to the second substrate does not include intermixing the solder member material with the joiner solder (see Fig. 5B) .

But it does not disclose expressly that the solder member comprises Sn-Sb alloy, the composition of each element in the alloy, that the joiner solder is lead-free, and the joiner solder reflows at a temperature below a highest temperature which will not damage any portion of the electronic structure or about 250C.

However, the missing limitations are well known in the art because Kang discloses the use of lead-free solder having Sn-Sb alloy of mainly Sn with a content of Sb in the range of 1-10% (See page 4) .

A person of ordinary skill is motivated to modify Desai with Kang to obtain reliable device without the harmful health effect of lead . In a similar manner it would have been obvious to use a modified lead-free joiner solder to substitute for the Sn-Pb in Desai. It would also obvious for a person of ordinary skill in the art to use a temperature low enough to be able to reflow the joiner solder without damaging other portion of the electronic structure, especially aluminum commonly used in semiconductor, below 250 C would be desirable.

Therefore, it would have been obvious to combine Desai with Kang to obtain the invention as specified in claims 7-11, 16-18, 19, 24, 25, 29, and 30 .

6. Claims 12 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Desai in view of Kang, as applied to claims 7-11, 16-18, 19, 24, 25, 29, and 30 above, and further in view of Sakai et al., US Patent 6077477 (hereinafter Sakai).

The combined teaching of Desai and Kang discloses substantially the limitations of claims 12 and 28, as shown above.

But it does not disclose expressly the use of a joiner solder comprising a Sn-Ag-Cu alloy and the content of each metal in the alloy .

However, the missing limitations are well known in the art because Sakai discloses these features (See abstract) .

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A person of ordinary skill is motivated to modify Desai and Kang with Sakai to obtain excellent thermal fatigue resistance (see abstract) .

Therefore, it would have been obvious to combine Desai and Kang with Sakai to obtain the invention as specified in claims 12 and 28 .

Allowable Subject Matter

7. Claims 4, 13-15, and 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 4 recites the feature “ wherein the soldering step reduces a height of the solder member between about 25% and 30%”.

Claim 13 recites the feature “wherein the step of soldering the solder member to the second substrate includes reflowing the joiner solder at a temperature between about 230 C and about 250 C”.

Claim 14 recites the feature “wherein the step of soldering the solder member to the second substrate includes melting the solder member”.

Claim 26 recites the feature “wherein the tin-antimony is intermixed with the joiner solder”.

These features in combination with the other elements of the claims are neither disclosed nor suggested by the prior art of record.

Claim 15 depends from claim 14, it is allowed for the same reason.

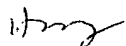
Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ha Nguyen whose telephone number is (703)308-2706 . The examiner can normally be reached on Monday-Friday from 8:30AM to 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Neibling, can be reached on (703) 308-3325. The fax phone number for this Group is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.

Primary Examiner



Ha Nguyen

01-25-02